Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims

Claim 1 (currently amended): A method of identifying a defect in a ~~substrate~~ semiconductor wafer comprising a plurality of conductive lines and a plurality of vias, the method comprising:

imaging an area directly on a top surface of the ~~substrate~~ semiconductor wafer with and without application of heat directly to the top surface, to obtain a hot image and a cold image respectively;

~~comparing at least a portion of the hot image with a corresponding portion of the cold image; and~~

~~providing an indication about a suspected defect in response to the comparison~~

wherein the top surface is an exposed surface of the semiconductor wafer closest to active regions therein;

repeating multiple times in a second, said imaging with and without application of heat to generate a plurality of hot images and a plurality of cold images;

comparing the plurality of hot images and said hot image with the plurality of cold images and said cold image; and

identifying said defect based on the comparison.

Claim 2 (currently amended): The method of Claim 1 further comprising, prior to said identifying:

~~repeating said imaging and said comparing; and~~

averaging ~~said result~~ results from each comparing to obtain an averaged comparison result;

wherein said identifying uses said averaged comparison result.

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Claim 3 (currently amended): The method of Claim 1 further comprising, during said identifying:

checking if ~~said~~ a result of comparing differs significantly relative to previous results of said comparing.

Claim 4 (currently amended): The method of Claim 1 further comprising, during said identifying:

checking if ~~said~~ a result of comparing exceeds a predetermined value.

Claim 5 (original): The method of Claim 4 wherein:

said predetermined value is responsive to a type of material expected to be present, and size and geometry of a feature to be fabricated.

Claim 6 (original): The method of Claim 1 further comprising:

adjusting intensities in said hot image to ensure that a majority of adjusted intensities are at least substantially same as intensities at corresponding locations in the cold image.

Claim 7 (original): The method of Claim 6 further comprising, during said comparing:

subtracting adjusted intensities for the hot image from intensities at corresponding locations in the cold image, thereby to obtain said results of said comparing for each location.

Claim 8 (currently amended): The method of Claim 1 further comprising~~, during said comparing~~:

adjusting intensities in at least one of said hot and cold images to ensure that a majority of adjusted intensities are at least substantially same as intensities at corresponding locations in the other of said hot and cold images.

Claim 9 (currently amended): The method of Claim 1 further comprising:

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adjusting gain and offset of ~~said~~ intensities in said images.

Claim 10 (original): The method of Claim 1 further comprising, during said comparing:

normalizing intensities in each of said hot and cold images; and

subtracting normalized intensities in one of said hot and cold images from normalized intensities in the other of said hot and cold images.

Claim 11 (original): The method of Claim 1 further comprising, during said comparing:

subtracting intensities in said cold image from intensities in said hot image, thereby to obtain a difference in intensities for each location.

Claim 12 (canceled).

Claim 13 (currently amended): The method of Claim [[12]] 1 wherein:

said hot image is imaged during applying heat.

Claim 14 (currently amended): The method of Claim [[12]] 1 wherein:

said hot image is imaged immediately after said applying heat; and

said cold image is imaged subsequent to imaging of said hot image but prior to applying heat again.

Claim 15 (canceled).

Claim 16 (currently amended): ~~The method of Claim 12 wherein:~~ A method of identifying a defect in a substrate, the method comprising:

imaging an area of the substrate with and without application of heat, to obtain a hot image and a cold image respectively;

comparing at least a portion of the hot image with a corresponding portion of the cold image; and

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providing an indication about a suspected defect in response to the comparison;

wherein heat is applied by a heating beam; and

wherein a probe beam illuminates said area at least during imaging, said probe beam having a different wavelength than said heating beam.

Claim 17 (currently amended): ~~The method of Claim 12 wherein:~~ A method of identifying a defect in a substrate, the method comprising:

imaging an area of the substrate with and without application of heat, to obtain a hot image and a cold image respectively;

comparing at least a portion of the hot image with a corresponding portion of the cold image; and

providing an indication about a suspected defect in response to the comparison;

wherein heat is applied by a laser beam; and

wherein said laser beam also illuminates said area at least during imaging, said laser beam having a lower intensity during illumination for imaging than during applying of heat.

Claim 18 (original): The method of Claim 1 wherein:

said imaging uses a plurality of sensors located along a straight line.

Claim 19 (original): The method of Claim 18 further comprising:

repeating said imaging along a plurality of lines parallel to said straight line;

wherein each line in said plurality of lines is separated from an adjacent line in said plurality of lines by a predetermined distance.

Claim 20 (original): The method of Claim 1 wherein:

said imaging uses a plurality of sensors located in a two-dimensional plane.

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Claim 21 (original): The method of Claim 1 wherein a differential image is obtained from said comparing, the method further comprising:

repeating said imaging and said comparing in corresponding areas of a plurality of dies, to obtain a differential image for each die; and

making a die-to-die comparison of the differential images, to identify each defective location.

Claim 22 (original): The method of Claim 21 wherein:

for each die a plurality of differential images are obtained and averaged to obtain an averaged differential image; and

the averaged differential images are compared to one another during said die-to-die comparison.

Claim 23 (original): The method of Claim 1 wherein a differential image is obtained from said comparing, the method further comprising:

repeating said imaging and said comparing in a plurality of cells, to obtain a differential image for each cell; and

making a cell-to-cell comparison of the differential images, to identify each defective location.

Claim 24 (original): The method of Claim 1 wherein:

during said imaging the hot image is obtained by simultaneously making a plurality of measurements in said area to obtain a corresponding plurality of pixels for the hot image and the cold image is obtained at a different time by simultaneously making another plurality of measurements in said area to obtain another plurality of pixels for the cold image.

Claim 25 (original): A method of identifying a defect in a substrate, the method comprising:

heating an area of said substrate with a heating beam;

imaging said area while heat is dissipating therefrom, thereby to obtain a hot image;

imaging said area either prior to said heating or after a majority of said heat is dissipated, thereby to obtain a cold image;

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wherein during at least one of said imagings, said area is illuminated by a probe beam; and

comparing the hot image with the cold image to obtain a differential image;

repeating said heating, said imaging and said comparing; and

averaging results of said comparing at each location across all differential images, to obtain an averaged differential image; and

identifying a location as having said defect if a value in the averaged differential image at said location differs significantly relative to corresponding values at other locations.

Claim 26 (original): The method of Claim 25 wherein:

said other locations are preselected to have one of: a type of material expected to be present, size and geometry of a feature to be fabricated.

Claim 27 (original): An apparatus for identifying a defect in a substrate, the apparatus comprising:

a heating source, for heating an area of the substrate;

an illumination source, for illuminating the area being heated by the heating source;

a plurality of sensors, for obtaining a hot image and a cold image respectively of the area; and

a processor, for comparing at least a portion of the hot image with a corresponding portion of the cold image, and providing an indication about a suspected defect in response to the comparison.

Claim 28 (original): The apparatus of Claim 27 wherein said processor receives a plurality of hot and cold images for said area, said processor being programmed to:

average results of said comparing to obtain an averaged comparison result; and

use said averaged comparison result to generate said indication.

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Claim 29 (original): The apparatus of Claim 27 further comprising a switching circuit coupled to the heating source and the plurality of sensors, the switching circuit being

configured to automatically turn on and off the heating source at a first frequency that is half of a second frequency of imaging by the plurality of sensors.

Claim 30 (original): The apparatus of Claim 29 wherein:
said switching circuit comprises an acousto-optic crystal.

Claim 31 (original): The apparatus of Claim 29 wherein:
said switching circuit comprises an electro-optic crystal.

Claim 32 (original): The apparatus of Claim 29 wherein:
said switching circuit comprises means for modulating electrical drive current to said laser.

Claim 33 (original): The apparatus of Claim 29 wherein said processor receives a plurality of hot and cold images for said area, said processor being programmed to:
average results of said comparing at each location to obtain an averaged comparison result for each location; and
use said averaged comparison result during said identifying.

Claim 34 (original): The apparatus of Claim 29 wherein said illumination source comprises an arc lamp.

Claim 35 (original): The apparatus of Claim 29 wherein said illumination source comprises a laser.

Claim 36 (original): The apparatus of Claim 29 wherein said plurality of sensors are located along a straight line.

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Claim 37 (original): The apparatus of Claim 29 wherein said plurality of sensors are located along a two dimensional plane, and are included in an area camera.

Claim 38 (original): The apparatus of Claim 29 wherein said plurality of sensors are included in a CCD camera, said apparatus comprising said CCD camera.

Claim 39 (original): An apparatus for identifying a defect in a substrate, the apparatus comprising:

a first source of electromagnetic radiation;

a second source of electromagnetic radiation, the second source being located relative to the first source to illuminate an area of the substrate to be illuminated by said first source;

a plurality of photodetectors sensitive to electromagnetic radiation from the second source; and

a switching circuit having a first line connected to said first source, and a second line connected to said plurality of sensors;

wherein the switching circuit supplies a first control signal on the first line to automatically turn on and off said first source at a first frequency;

wherein the switching circuit a second control signal on the second line to turn on and off the photodetectors at a second frequency, the second frequency being twice the first frequency;

wherein a first phase difference between turning on of the first source and a first turning on of the photodetectors immediately thereafter, is sufficiently small to ensure that the photodetectors capture a first image of said area while heat is dissipating therefrom; and

wherein a second phase difference between turning on of the first source and a second turning on of the photodetectors immediately after the first turning on is sufficiently large to ensure that said photodetectors capture a second image of said area after a majority of said heat is dissipated therefrom.

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Claim 40 (original): The apparatus of Claim 39 wherein:

the switching circuit has a third line connected to the second source of electromagnetic radiation; and

the switching circuit supplies a third control signal on the third line to turn on and off the second source at the second frequency.

Claim 41 (original): The apparatus of Claim 39 wherein:

the switching circuit is decoupled from the second source of electromagnetic radiation.

Claim 42 (original): The apparatus of Claim 39 further comprising:

a computer coupled to the plurality of photodetectors to receive therefrom each of the first image and the second image;

wherein said computer is programmed to compare said first image and said second image and to identify said area as being suspected of containing said defect based on a result of comparison.

Claim 43 (original): The apparatus of Claim 39 wherein:

the switching circuit is coupled by a third line to the second source of electromagnetic radiation; and

the third line is deactivated.

Claim 44 (original): The apparatus of Claim 39 wherein said plurality of photodetectors are located along a straight line.

Claim 45 (original): The apparatus of Claim 39 wherein said plurality of photodetectors are located along a two dimensional plane, and are included in an area camera.

Claim 46 (original): The apparatus of Claim 39 wherein said plurality of photodetectors are included in a CCD camera, said apparatus comprising said CCD camera.

Claim 47 (new): The method of Claim 1 wherein:

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a probe beam illuminates said area at least during imaging.

Claim 48 (new): The method of Claim 1 wherein:

the cold image is imaged only after a majority of heat is dissipated from the area.

Claim 49 (new): A method of evaluating a semiconductor wafer for a defect, the method comprising:

imaging an area on a top surface of the semiconductor wafer with and without heating the top surface, to obtain a hot image and a cold image respectively;

wherein the area on the top surface is illuminated with a beam of electromagnetic radiation at least when one of the hot image and the cold image are imaged; and

identifying a location in the semiconductor wafer as having said defect based at least on the hot image and the cold image.

Claim 50 (new): The method of Claim 49 wherein:

an additional beam illuminates said area during heating.

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